The Laryngeal-closure Reflex and Nitrous Oxide–Oxygen Analgesia

P. Cleaton-Jones, B.D.S., M.B., B.Ch., Ph.D., D.A.*

Nitrous oxide–oxygen sedation is in daily use in dental practice, following the pioneering work of practitioners such as Lang.1 With this technique, nitrous oxide is administered in analgesic concentrations, together with oxygen, using special apparatus with built-in oxygen fail-safe devices.2

Although no fatality or severe complication from this technique has been reported, it has been suggested by Pleasants3 that the pharyngeal protective reflexes may be diminished. If this is so, then material from the oral cavity could be inhaled during dental treatment using nitrous oxide–oxygen sedation, which is an inherently dangerous situation.

This study was undertaken to see whether nitrous oxide–oxygen sedation caused any depression of the pharyngo-laryngeal reflexes.

METHODS AND MATERIALS

Following investigation and approval of the experimental protocol by the University’s Committee on Research on Humans, informed consent, in writing, was obtained from 14 fit, final-year dental students. They ranged in age from 22 to 29 years, with a mean age of 23.6 ± 2.5 years. Prior to the investigation they were neither starved nor premedicated.

Each subject was placed in the supine position on a radiographic table and a mixture of 5 l/min N₂O plus 5 l/min O₂ was administered via a loosely-fitting soft nasal mask, from a Quantiflex apparatus (Cyprane Ltd., Keighley, England). This mixture was chosen for the study because it is commonly used in dental practice.

Electroencephalographic studies1 have shown the effect of N₂O to be present within 5–10 minutes, and personal clinical experience with the gas mixture used in the present experiment has shown its effects to occur within 3 minutes from the onset of inhalation. The subjects were thus given the N₂O:O₂ mixture for 5 minutes before swallowing a dye. Ten milliliters of Dionisil (a suspension of propyliodone used in bronchography—Glaxo Laboratories Ltd., Greenford, England) were then placed in the back of each subject’s mouth with a syringe, and swallowed. Chest radiographs were taken 1 and 5 minutes after this swallow. Administration of N₂O was then discontinued and pure O₂ substituted. Recovery occurred within 2 minutes.

During the entire procedure an electronic cardiac monitor was used to monitor the subject’s ECG, and blood pressure and pulse were recorded at 3-minute intervals.

RESULTS

The subjects experienced no untoward reaction, no ECG abnormality was observed, while systolic and diastolic blood pressures and pulse rates remained relatively constant throughout the experiment.

Traces of the radiopaque dye was seen in the lower esophagus of every subject, but in none of them was any dye seen in the larynx, trachea, bronchi or pulmonary parenchyma.

DISCUSSION

The swallowing of a radiopaque dye has been used in a number of studies to show that the laryngeal closure reflex is depressed during conventional anesthesia4–7 and may not return to normal until 2 hours after awakening from anesthesia.5

The present study, the first such study reported using N₂O-O₂ sedation (relative analgesia) has shown that when a 50:50 mixture of N₂O:O₂ is used the laryngeal closure reflex remains intact, a result different from that described to occur with conventional anesthesia. This finding does not support the hypothesis of Pleasants,3 and is additional evidence of the safety of the sedation technique.
The author thanks Mrs. D. Grist, Mrs. R. Ichilek, and Miss E. Vieira for their invaluable assistance; all the volunteers for their co-operation; and for kindly supplying the Quantiflex apparatus, the Commercial and Industrial Dental Co., Johannesburg.

REFERENCES


The Precordial Electrocardiographic Lead (V₃) in Patients
Who Have Coronary-artery Disease

JOEL A. KAPLAN, M.D.* And SPENCER B. KING, M.D.†

The electrocardiograph (ECG) is now used as a routine monitor during anesthesia and operation. Cannard and co-workers showed the value of the ECG in diagnosing rhythm disturbances during anesthesia. Standard limb lead II is usually observed because its axis parallels the electrical axis of the heart and the P wave is usually easily seen.

In recent years, coronary-artery disease has become the number one health problem in the United States. Patients coming for all types of surgical procedures have significant coronary-artery disease, and many have histories of acute myocardial infarction or angina pectoris. In these patients, the ECG should be used to identify myocardial ischemia during the stress of anesthesia and operation, as well as for arrhythmia recognition.

The graded ECG exercise test is routinely used by cardiologists to diagnose coronary-artery disease. Blackburn showed that 89 percent of the ST-segment information contained in the conventional 12-lead exercise ECG is found in lead V₃. Therefore, we began monitoring lead V₃, along with leads I, II, III, AVR, AVL, AVF, in all patients with known coronary-artery disease. Below, we present three cases in which significant myocardial ischemia occurred intraoperatively and was observed only in lead V₃. This information led to early treatment of the ischemic episodes.

REPORT OF THREE CASES

Case 1. A 65-year-old man was scheduled for a saphenous vein-bypass graft to the left anterior descending coronary artery. He had previously had three episodes of myocardial infarction and had progressively unstable angina pectoris. The ECG showed Q waves in leads II, III, and AVF, and nonspecific ST-segment changes. Coronary arteriography demonstrated total obstruction of the right coronary artery and more than 75 percent cross-sectional narrowing of the left anterior descending coronary artery. Left ventricular end-diastolic pressure was 16 torr, and calculated ejection fraction was 0.40. Medications included digoxin and procaïnamide. Preoperative blood pressures ranged from 128/80 to 140/85 torr, while heart rate was 80/min.

Anesthesia was induced with morphine, 35 mg, and diazepam, 15 mg, and maintained with 50 percent nitrous oxide, enflurane, and pancuronium. Vital signs were stable, with blood pressure 115/60 torr, heart rate 65/min, central venous pressure 10 cm H₂O, and isoelectric ST-segments in all seven leads of the electrocardiogram during the initial stages of the anesthesia and operation. At the time of the sternotomy, the patient was receiving 50 percent nitrous oxide and 1 percent...